
CLAIMS

[Claim(s)]
[Claim 1] The manufacturing facility of the fullerene characterized by having supplied oxygen content gas and carbon content fuel gas in the fission reactor from the burner formed in this a part of fission reactor, being the manufacturing facility of the fullerene which manufacture fullerene, making these react under reduced pressure and generating soot, having avoided substantially the directly under location of the soot adhesion field of said fission reactor, and forming said burner in said fission reactor.
[Claim 2] It is the manufacturing facility of the fullerene moreover characterized by said fission reactor being a cylinder like object with base-like, a pars basilaris ossis occipitalis being equipped with said burner, and the upper part being equipped with an exhaust port in the manufacturing facility of fullerene according to claim 1, respectively, and arranging said fission reactor aslant, and not finding said burner in the directly under field of said soot adhesion field formed in the upper part of this fission reactor, or crossing in 10% or less of range.
[Claim 3] It is the manufacturing facility of the fullerene which said fission reactor is equipped with a cylinder-like-object-with-base-like fission reactor body, and the upper part is equipped with an exhaust port in the manufacturing facility of fullerene according to claim 1, and are characterized by forming said burner through 1 or two or more short cylinder portions which were prepared in the side attachment wall of said fission reactor body.
[Claim 4] It is the manufacturing facility of the fullerene characterized by preparing said short cylinder portion outside to the axial center of said fission reactor body in the manufacturing facility of fullerene according to claim 3 at the declivity.
[Claim 5] It is the manufacturing facility of the fullerene characterized by forming said burner in the side attachment wall of said fission reactor in the manufacturing facility of fullerene according to claim 1.
[Claim 6] It is the manufacturing facility of the fullerene characterized by said burner being substantially annular in the manufacturing facility of fullerene according to claim 5.
[Claim 7] The manufacture approach of the fullerene which carbon content fuel gas and oxygen content gas are made to react in said fission reactor, and manufacture fullerene continuously, without dropping soot on said burner which blows off carbon content fuel gas and oxygen content gas using the manufacturing facility of the fullerene of a publication in any 1 term of claims 1-6.

[Translation done.]

* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of the fullerene which used the manufacturing facility of fullerene (C60, C70, C76, C78, and C84 are included), and this.
[0002]
[Description of the Prior Art] Fullerene is the generic name of the third carbon allotrope which ranks second to a diamond and a graphite, and is the carbon molecule of the shape of hollow husks closed in a network of five membered-rings and six membered-rings which is represented by C60 and C70 grade. Although it is comparatively that existence of fullerene was finally checked and it is a comparatively new carbon material, it is admitted that a specific physical property is shown because of the special molecular structure, for example, innovative application development is being quickly developed over the wide range following fields.
(1) Since purification of the artificial diamond which has a fine crystal grain child by using application fullerene to a superhard ingredient as a precursor is attained, use to an abrasion resistance material with added value is expected.
(2) If metallic potassium is doped to the application fullerene thin film to drugs, it is discovered that a superconducting material with a high transition temperature called 18K can be made, and since various, attract attention.
(3) It uses that resist structure is further strengthened with mixing C60 with the application resist to a semiconductor device, and the application to next-generation semi-conductor manufacture is expected. Also in the fullerene of various carbon numbers, C60 and C70 are comparatively easy to compound, and it is expected that future need so also increases explosively. As the manufacture approach of fullerene learned now, although there are laser vacuum deposition, a resistance heating method, an arc discharge method, a radio frequency heating method, a combustion method, a naphthalene thermal decomposition method, etc., the combustion method to which the incomplete combustion of the oxygen content gas of inert gas, such as helium, and oxygen and the carbon content fuel gas which gasified raw materials, such as benzene and toluene, is carried out in a fission reactor has a comparatively cheap manufacturing cost all over a combustion furnace.
[0003]
[Problem(s) to be Solved by the Invention] Carbon content fuel gas and oxygen content gas were introduced through the burner 51, respectively in the fission reactor (combustion furnace) 50 which constitutes the manufacturing facility of fullerene, in this combustion method, as shown in drawing 7 , the soot which makes carbon a subject since it is common to carry out incomplete combustion under reduced pressure was generated, and this soot adhered to head lining 52 part of a fission reactor 50, for example, and when coating weight increased, it had fallen down the fission reactor 50 with gravity. For this reason, on the burner 51 formed in the pars basilaris ossis occipitalis 53 of a fission reactor 50, soot fell and the problem of the carbon content fuel gas from a burner 51 and oxygen content gas of producing trouble blowing off was. In addition, 54 shows an exhaust port. This invention was made in view of this situation, and

even if the soot adhering to a fission reactor falls, it will aim at offering the manufacturing facility of the fullerene which are not influenced, and the manufacture approach of fullerene using this to operation of a fission reactor.

[0004]

[Means for Solving the Problem] the manufacturing facility of the fullerene concerning the 1st invention in alignment with said purpose is the manufacturing facility of the fullerene which supply oxygen content gas and carbon content fuel gas in a fission reactor from the burner formed in a part of this fission reactor, and these are made to react under reduced pressure, make generate soot, and manufacture inside fullerene, avoided substantially the directly under location of the soot adhesion field of said fission reactor, and has formed said burner in said fission reactor. Since the soot which falls from a soot adhesion field cannot fall easily on a burner due to this, a continuation target can do manufacture of fullerene. Moreover, in the manufacturing facility of the fullerene which the manufacturing facility of the fullerene concerning the 2nd invention requires for the 1st invention, said fission reactor is a cylinder like object with base-like, a pars basilaris ossis occipitalis is equipped with said burner, the upper part is equipped with an exhaust port, respectively, said fission reactor is arranged aslant, and said burner cannot be found in the directly under field of said soot adhesion field formed in the upper part of this fission reactor, or it crosses in 10% or less of range. Moreover, in the manufacturing facility of the fullerene which the manufacturing facility of the fullerene concerning the 3rd invention requires for the 1st invention, said fission reactor is equipped with a cylinder-like-object-with-base-like fission reactor body, the upper part is equipped with an exhaust port, and said burner is formed through 1 or two or more short cylinder portions which were prepared in the side attachment wall of said fission reactor body. In the manufacturing facility of the fullerene which the manufacturing facility of the fullerene concerning the 4th invention requires for the 3rd invention, said short cylinder portion is prepared outside to the axial center of said fission reactor body at the declivity.

[0005] In the manufacturing facility of the fullerene which the manufacturing facility of the fullerene concerning the 5th invention requires for the 1st invention, said burner is formed in the side attachment wall of said fission reactor. In the manufacturing facility of the fullerene which the manufacturing facility of the fullerene concerning the 6th invention requires for the 5th invention, said burner is substantially annular. And without dropping soot using the manufacturing facility of the fullerene concerning the 1st - the 6th invention on said burner which blows off carbon content fuel gas and oxygen content gas, the manufacture approach of the fullerene concerning the 7th invention makes carbon content fuel gas and oxygen content gas react in said fission reactor, and is manufacturing fullerene continuously. In addition, in the 1st - the 7th invention, as for the case where the premix of carbon content fuel gas and the oxygen content gas is carried out beforehand, and they spout from the nozzle of a burner, and the nozzle which spouts carbon content fuel gas and the nozzle which spouts oxygen content gas, a burner includes the case where it is prepared separately. Furthermore, also when the inert gas other than pure oxygen, such as HERIURU and an argon, mixes in oxygen content gas and is diluted, it contains in it.

[0006]

[Embodiment of the Invention] Then, referring to the attached drawing, it explains per gestalt of the operation which materialized this invention, and an understanding of this invention is presented. The outline sectional side elevation of the manufacturing facility of the fullerene which drawing 1 requires for the gestalt of operation of the 1st of this invention here, The outline sectional side elevation of the manufacturing facility of the fullerene which drawing 2 requires for the gestalt of operation of the 2nd of this invention, The outline sectional side elevation of the manufacturing facility of the fullerene which drawing 3 requires for the gestalt of operation of the 3rd of this invention, a view A-A sectional view [in / in drawing 4 / drawing 3], the outline sectional side elevation of the manufacturing facility of the fullerene which drawing 5 requires for the gestalt of operation of the 4th of this invention, and drawing 6 are the view B-B sectional views in drawing 5 .

[0007] As shown in drawing 1 , the manufacturing facility 10 of the fullerene concerning the gestalt of operation of the 1st of this invention has the fission reactor (combustion furnace) 11 by which inclination arrangement was carried out. The side attachment wall 12 of a fission reactor 11 has the hull which consists of ingredients, such as stainless steel and heat-resisting steel, and the refractory material stuck on the inside, and is constituted (also in the gestalt of the following operations, it is fundamentally the same). The upper part of a side attachment wall 12 is connected in [the head-lining section 13 whose diameter is reduced gradually] one, and the exhaust port 14 is established in the summit section. The flange for anchoring may be prepared in the exhaust port 14. And to the apparent vertical, at 10 - 80 degrees (preferably the range of 20 - 70 degrees), the axial center of this fission reactor 11 inclines, and is installed. Moreover, the burner 15 which has the nozzle of a large number which blow off carbon content fuel gas and oxygen content gas is formed in the pars basilaris ossis occipitalis of the cylinder-like-object-with-base-like fission reactor 11. If carbon content fuel gas and oxygen content gas are gradually blown off from this burner 15 and incomplete combustion is carried out under reduced pressure in a fission reactor 11, the soot adhesion field 16 where soot is generated and soot adheres to the head-lining section 13 will be formed. The premix of carbon content fuel gas and the oxygen content gas may be carried out, you may spout in a fission reactor 11, and this burner 15 may spout separately carbon content fuel gas and oxygen content gas from an exhaust nozzle or a pipe (also in the gestalt of the following operations, it is the same).

[0008] The boundary of the soot adhesion field 16 and a **** miscarriage field extends the periphery line of a burner 15 up in parallel to the axial center of a fission reactor 11 (the opposite ridgeline is shown by Segments a and b in drawing 1), and is understood to be the field surrounded by the circle which intersects the head-lining section 13. It is because the side attachment wall 12 of a fission reactor 11 of the reason is cylindrical, the substantial diameter of a burner 15 turns into 85 - 98% of the bore of a fission reactor 11, the gas and soot which combusted incompletely along with near and the periphery circle of a burner 15 in the bore of a fission reactor 11 go up, the flow of gas changes in the head-lining section 13 and soot adheres. And the adhesion degree of the soot of a part with the flow of gas near the core which changes a lot in practice is large, and the adhesion degree of soot decreases as the perimeter. Therefore, although it is more desirable that a burner 15 does not exist in this soot fall field 17 since the directly under location field (it sets to drawing 1 and is right-hand side [Perpendicular / c]) of the soot adhesion field 16 turns into a fall field of soot, even if a burner 15 crosses in 10% or less of range, it will be convenient in practice. In addition, although soot may adhere also to a **** adhesion field in practice, since there are few amounts of the soot which adheres in this case, it does not become a big problem.

[0009] Then, although the manufacturing facility of the fullerene concerning the gestalt of operation of the 2nd of this invention shown in drawing 2 is explained, the number same about the same component as the gestalt of said operation is attached, and the detailed explanation is omitted (also in the gestalt of the following operations, it is the same). With the gestalt of this operation, the burner 15 is formed in the pars basilaris ossis occipitalis of fission reactor body 19a to which that fission reactor 19 has a flection 20 in the upper part, and the manufacturing facility of fullerene inclined aslant in 10 - 80 degrees (preferably 20 - 70 degrees). If the slanting upper part is made to extend the periphery circle d of a burner 15 along with the axial center of a fission reactor 19, the soot adhesion field 21 will be formed in the part of a flection 20. From the directly under location field (it sets to drawing 2 and is right-hand side [Segment / e]) of this soot adhesion field 21, a burner 15 separates and is formed. In addition, as the gestalt of previous operation described, the directly under location field of the soot adhesion field 21 may be intersected in less than 10% of range of the top-face product of a burner 15. In addition, 23 shows the reaction termination section which follows fission reactor body 19a and by which level arrangement was carried out, and the exhaust port is established in this downstream. In the fission reactors 11 and 19 concerning the gestalt of said operation, although the pars basilaris ossis occipitalis inclines to a horizontal plane, as shown in drawing 1 and drawing 2 , also when carrying out level arrangement of the partes basilaris ossis occipitalis

24 and 25 and also arranging a burner 15 horizontally, this invention is applied.
[0010] Next, the manufacturing facility of the fullerene concerning the gestalt of operation of the 3rd of this invention shown in drawing 3 and drawing 4 is explained. The fission reactor 26 of the manufacturing facility of the fullerene concerning the gestalt of the 3rd operation is equipped with the fission reactor body 27 of the shape of a cylinder like object with base by which erection arrangement was carried out, and the exhaust port 28 is established in the center of the upper part. At a declivity, the short cylinder portion 30 of plurality (the gestalt of this operation 6) carries out plane view outside, and is prepared [as opposed to / in the lower side attachment wall 29 of the fission reactor body 27 / the axial center of the fission reactor body 27] in it at a radial, and the burner 31 is formed in that pars-basilaris-ossis-occipitalis 30a, respectively. This burner 31 is substantially [as the above mentioned burner 15] the same. In the case of the gestalt of this operation, the soot adhesion field 32 is formed at the head-lining section 33 of the fission reactor body 27. The carbon content fuel gas and oxygen content gas by which this reason blew off from each burner 31 combust incompletely by the fission reactor body 27, and are because it moves up by suction of the exhaust air pump (or vacuum pump) which is not illustrated, it collides with the head-lining section 33 and soot adheres.
[0011] Since a burner 31 avoids and is arranged from the directly under field of this soot adhesion field 32, soot does not collect on a burner 31. Soot collects on the pars basilaris ossis occipitalis 34 of the fission reactor body 27. Although the pars basilaris ossis occipitalis 34 of the fission reactor body 27 is made into the plane with the gestalt of this operation, as a two-dot chain line shows to drawing 3 , it is desirable to make it discharge outside periodically through the rotary bulb which collected the soot which forms the reverse truncated-cone-like soot stripping section 35, and falls, for example, was prepared in that lower part. Continuation manufacture of fullerene is attained by this. In addition, the include angle of a short cylinder portion 30 is arbitrary, and although it is possible to exceed 0 times or 0 times to a horizontal plane, and to install in 80 degrees, the shortest possible one of a short cylinder portion 30 is desirable, and it is good [a short cylinder portion] to prepare also from the convenience on construction in 0 - 60 degrees (still more preferably 15 - 50 degrees).
[0012] Although the manufacturing facility of the fullerene concerning the gestalt of the operation of the 4th of this invention in which the manufacturing facility of the fullerene concerning the gestalt of operation of the 3rd of this invention was further developed into drawing 5 and drawing 6 is shown, as shown in drawing, a fission reactor 36 has the fission reactor body 37, and the annular burner 39 is formed in the lower side attachment wall 38. It has the nozzle (pipe) of a large number which have the nozzle which spouts the carbon content fuel gas with which this burner 39 was fundamentally the same as the burner 15 with fuel gas, and the premix was carried out, and oxygen content gas, or spout independently carbon content fuel gas and oxygen content gas, respectively. In addition, each exhaust nozzle of a burner 39 may be arranged on the radial outside from the case where it has projected in the small range from the lower side attachment wall 38, the case of being in agreement with the lower side attachment wall 38, and the lower side attachment wall 38 (a broken line shows to drawing 6). Although the soot from the upper part wears some to the top for a burner 39 lobe in projecting in the range where each exhaust nozzle of a burner 39 is small, the significant part of a burner 39 does not become soot does not necessarily wear on an exhaust nozzle, therefore is directly under the soot adhesion field 32 substantially.
[0013] When a burner 39 is in agreement with the lower side attachment wall 38, and when a burner 39 is located in a radial outside from the lower side attachment wall 38, since soot does not wear on a burner 39, it is very effective, but when the diameter of the fission reactor body 37 is large, since the reaction of carbon content fuel gas and oxygen content gas is performed around the fission reactor body 37, the utilization factor of a fission reactor 36 falls. Therefore, the fission reactor 26 concerning the gestalt of the 3rd operation and the fission reactor 36 which starts the gestalt of the 4th operation similarly are preferably applied to the manufacturing facility of a medium size or small fullerene. In the manufacturing facility of the

3rd and the fullerene concerning the gestalt of the 4th operation, in the vertical direction, although the number of each burners 31 and 38 was one, they can also be made into two steps or three steps or more. By this, fullerene can be manufactured more efficiently.

[0014] This invention is not limited to the gestalt of each operation, and this invention is applied also when it constitutes the manufacturing facility of fullerene combining the component of the gestalt of each operation explained above. Moreover, in the gestalt of operation, there are aromatic hydrocarbon, such mixture, etc., such as alt.** meta besides the aliphatic series saturation which can use the thing of arbitration as carbon content fuel gas, for example, has a straight chain or branched chain, such as methane, ethane, a propane, ethylene, and a propylene, or unsaturated hydrocarbon, benzene, and toluene, a xylene of Para, naphthalene, and an anthracene. Although the conditions of arbitration may be set up as long as the combustion methods and conditions in a combustion method are conditions which fullerene generates, generally the approach of carrying out the incomplete combustion of the above-mentioned carbon content fuel gas is used using the mixed gas (oxygen content gas) of inert gas, such as helium and an argon, and oxygen. Although the combustion temperature in this case is based also on the class of carbon content fuel gas, it is usually about 1200-1700 degrees C more preferably 1000-2100 degrees C. Moreover, although what is necessary is just to also choose suitably the rate of the carbon content fuel gas and oxygen content gas in combustion, it becomes smaller oxygen content capacity to stoichiometric combustion oxygen content capacity. Moreover, although the pressure in a fission reactor is arbitrary if it is a pressure which can manufacture fullerene, generally it is good that it is 10 - 100torr more preferably ten to 600 torr.

[0015]

[Effect of the Invention] Since the manufacturing facility of fullerene according to claim 1 to 6 and the manufacture approach of fullerene according to claim 7 avoided substantially the directly under location of the soot adhesion field of a fission reactor and formed the burner in the fission reactor so that clearly from the above explanation, soot hangs on a burner and generating of carbon content fuel gas or oxygen content gas is not restricted. Therefore, maintenance check becomes easy and also long duration continuous running becomes possible. Since there is no burner in the directly under field of the soot adhesion field which a fission reactor is a cylinder like object with base-like especially in the manufacturing facility of fullerene according to claim 2, a pars basilaris ossis occipitalis is equipped with a burner, the upper part is equipped with an exhaust port, respectively, and a fission reactor is moreover arranged aslant, and is formed in the upper part of a fission reactor or it crosses in 10% or less of range, soot does not hang on a burner substantially. Furthermore, since the falling soot inclines toward the one side of a fission reactor, recovery of soot becomes easy. In the manufacturing facility of fullerene according to claim 3, a fission reactor is equipped with a cylinder-like-object-with-base-like fission reactor body, the upper part is equipped with an exhaust port, since the burner is formed through 1 or two or more short cylinder portions which were prepared in the side attachment wall of a fission reactor body, to a burner, soot is not certainly covered with it, and long-term continuous running of it becomes possible. Furthermore, since the incomplete combustion (namely, reaction) of oxygen content gas and carbon content fuel gas is not the side-attachment-wall side of a furnace and is performed by the central site, the design of the fireproof construction of a fission reactor body becomes easy.

[0016] Since the manufacturing facility of fullerene according to claim 4 is prepared outside to the axial center of a fission reactor body at the declivity, jet of carbon content fuel gas or oxygen content gas will turn to a top a little, the flow of gas approaches a laminar flow more, and the generating effectiveness of a short cylinder portion of fullerene increases it more. Since the burner is formed in the side attachment wall of a fission reactor, soot does not wear the manufacturing facility of fullerene according to claim 5. Furthermore, since the incomplete combustion of oxygen content gas and carbon content fuel gas is not the side-attachment-wall side of a furnace and is performed by the central site, the design of the fireproof construction

of a fission reactor body becomes easy. Since a burner is substantially annular, more, to homogeneity, oxygen content gas and carbon content fuel gas can be turned to a reactor core, and the manufacturing facility of fullerene according to claim 6 can blow off.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline sectional side elevation of the manufacturing facility of the fullerene concerning the gestalt of operation of the 1st of this invention.
[Drawing 2] It is the outline sectional side elevation of the manufacturing facility of the fullerene concerning the gestalt of operation of the 2nd of this invention.
[Drawing 3] It is the outline sectional side elevation of the manufacturing facility of the fullerene concerning the gestalt of operation of the 3rd of this invention.
[Drawing 4] It is a view A-A sectional view in drawing 3 .
[Drawing 5] It is the outline sectional side elevation of the manufacturing facility of the fullerene concerning the gestalt of operation of the 4th of this invention.
[Drawing 6] It is a view B-B sectional view in drawing 5 .
[Drawing 7] It is the explanatory view of the fission reactor used for manufacture of fullerene.
[Description of Notations]
The manufacturing facility of fullerene, 11:fission reactor, 12:side attachment wall, 13 : 10: The head-lining section, 14 : An exhaust port, 15:burner, 16:soot adhesion field, 17:soot fall field, 19 : A fission reactor, a 19a:fission reactor body, 20:flection, 21:soot adhesion field, 23: The reaction termination section, 24, 25:pars basilaris ossis occipitalis, 26:fission reactor, 27 : A fission reactor body, 28: -- an exhaust port, a 29:lower side attachment wall, 30:short cylinder portion, and 30a: -- a pars basilaris ossis occipitalis, 31:burner, 32:soot adhesion field, 33:head-linings sections, 34:pars basilaris ossis occipitalis, and 35: -- a soot stripping section, 36:fission reactor, 37:fission reactor body, a 38:lower side attachment wall, and 39:burner

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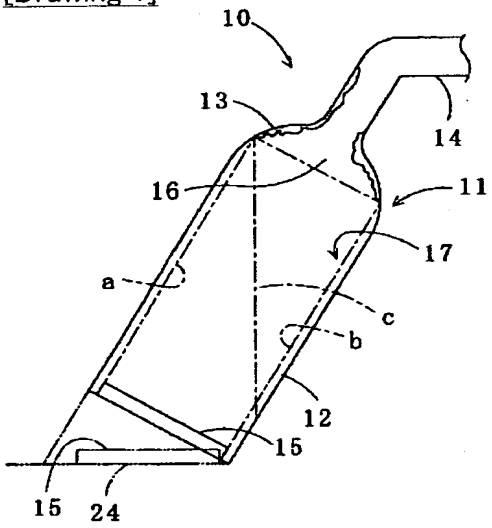
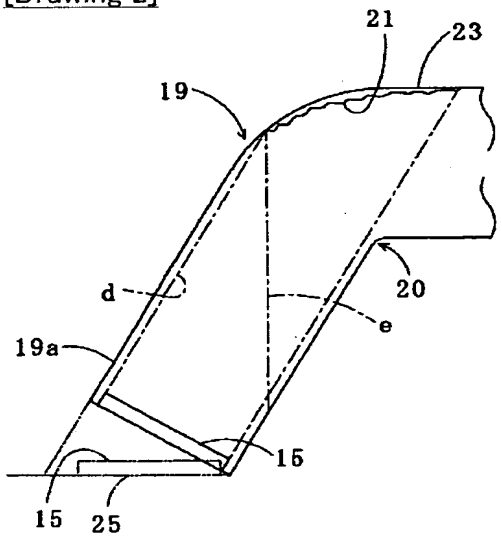
DRAWINGS

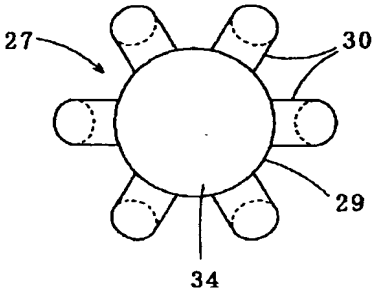
[Drawing 1]



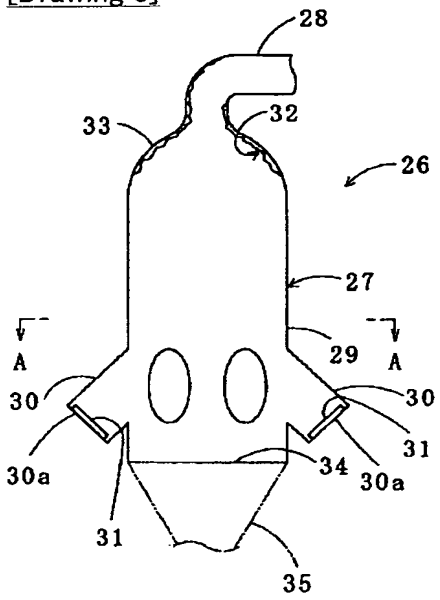
[Drawing 2]



[Drawing 4]



[Drawing 3]



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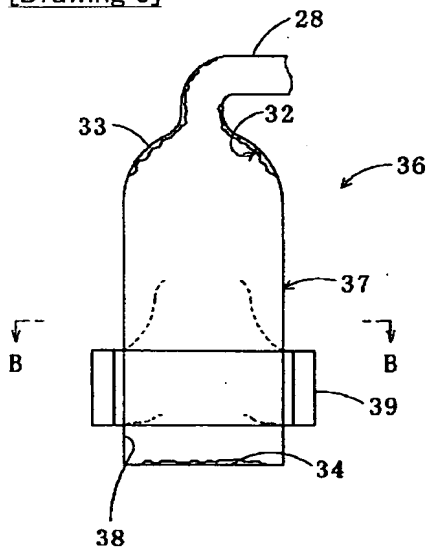
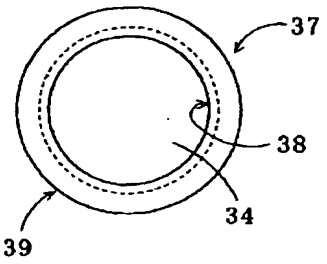
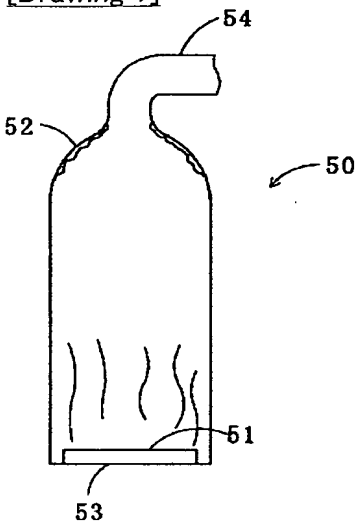


[Drawing 6]



[Drawing 7]



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